

SEQUENCE LISTING

<110> HAKAMADA, YOSHIHIRO
 OZAWA, TADAHIRO
 KOBAYASHI, TOORU

<120> MUTATED ALKALINE CELLULASE

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<140> 10/510,716
 <141> 2004-10-18

<150> PCT/JP03/05371
 <151> 2003-04-25

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<170> PatentIn version 3.3

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 Leu Val Leu Leu Ser Leu Phe Pro Ala Ala Leu Ala Ala Glu Gly
 20 25 30

aac act cgt gaa gac aat ttt aaa cat tta tta ggt aat gac aat gtt
 Asn Thr Arg Glu Asp Asn Phe Lys His Leu Leu Gly Asn Asp Asn Val
 35 40 45

aaa cgc cct tct gag gct ggc gca tta caa tta caa gaa gtc gat gga
 Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val Asp Gly
 50 55 60

caa atg aca tta gta gat caa cat gga gaa aaa att caa tta cgt gga

48

96

144

192

240

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gct	atg	tat	gta	ggt	gaa	aat	ggg	tac	gct	aca	aac	cct	gag	tta	atc	384
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Lys	Gln	Arg	Val	Ile	Asp	Gly	Ile	Glu	Leu	Ala	Ile	Glu	Asn	Asp	Met	
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Tyr	Val	Ile	Val	Asp	Trp	His	Val	His	Ala	Pro	Gly	Asp	Pro	Arg	Asp	
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cct	gtt	tat	gca	ggt	gct	aaa	gat	ttc	ttt	aga	gaa	att	gca	gct	tta	528
Pro	Val	Tyr	Ala	Gly	Ala	Lys	Asp	Phe	Phe	Arg	Glu	Ile	Ala	Ala	Leu	
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Tyr	Pro	Asn	Asn	Pro	His	Ile	Ile	Tyr	Glu	Leu	Ala	Asn	Glu	Pro	Ser	
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agt	aat	aat	aat	ggt	gga	gca	ggg	att	ccg	aat	aac	gaa	gaa	ggt	tgg	624
Ser	Asn	Asn	Asn	Gly	Gly	Ala	Gly	Ile	Pro	Asn	Asn	Glu	Glu	Gly	Trp	
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Lys	Ala	Val	Lys	Glu	Tyr	Ala	Asp	Pro	Ile	Val	Glu	Met	Leu	Arg	Lys	
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Ser	Gln	Arg	Pro	Asp	Leu	Ala	Ala	Asp	Asn	Pro	Ile	Asp	Asp	His	His	
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Thr	Met	Tyr	Thr	Val	His	Phe	Tyr	Thr	Gly	Ser	His	Ala	Ala	Ser	Thr	
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675

680

685

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Val Phe Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro			
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Glu Ala Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys Lys Ala			
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25

30

Asn Thr Arg Glu Asp Asn Phe Lys His Leu Leu Gly Asn Asp Asn Val
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Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn Asp Asn
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Ala Tyr Lys Ala Leu Ser Asn Asp Trp Asp Ser Asn Met Ile Arg Leu
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Ala Met Tyr Val Gly Glu Asn Gly Tyr Ala Thr Asn Pro Glu Leu Ile
115 120 125

Lys Gln Arg Val Ile Asp Gly Ile Glu Leu Ala Ile Glu Asn Asp Met
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Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro Arg Asp
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Pro Val Tyr Ala Gly Ala Lys Asp Phe Phe Arg Glu Ile Ala Ala Leu
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Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu Pro Ser
180 185 190

Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu Gly Trp
195 200 205

Lys Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Glu Met Leu Arg Lys
210 215 220

Ser Gly Asn Ala Asp Asp Asn Ile Ile Ile Val Gly Ser Pro Asn Trp
225 230 235 240

Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp His His
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Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala Ser Thr
260 265 270

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Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe Ala Thr
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Glu Trp Gly Thr Ser Gln Ala Ser Gly Asp Gly Gly Pro Tyr Phe Asp
305 310 315 320

Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile Ser Trp
325 330 335

Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala Phe Thr
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Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Asn Leu Asp Pro Gly Pro
355 360 365

Asp His Val Trp Ala Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val
370 375 380

Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys
385 390 395 400

Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe
405 410 415

Gly Val Asn Ser Asp Ser Pro Asn Lys Glu Leu Ile Ala Val Asp Asn
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Glu Asn Asn Thr Leu Lys Val Ser Gly Leu Asp Val Ser Asn Asp Val
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Ser Asp Gly Asn Phe Trp Ala Asn Ala Arg Leu Ser Ala Asn Gly Trp
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Gly Lys Ser Val Asp Ile Leu Gly Ala Glu Lys Leu Thr Met Asp Val
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Ile Val Asp Glu Pro Thr Thr Val Ala Ile Ala Ala Ile Pro Gln Ser
485 490 495

Ser Lys Ser Gly Trp Ala Asn Pro Glu Arg Ala Val Arg Val Asn Ala
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Glu Asp Phe Val Gln Gln Thr Asp Gly Lys Tyr Lys Ala Gly Leu Thr
515 520 525

Ile Thr Gly Glu Asp Ala Pro Asn Leu Lys Asn Ile Ala Phe His Glu
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Glu Asp Asn Asn Met Asn Asn Ile Ile Leu Phe Val Gly Thr Asp Ala
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Ala Asp Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val
565 570 575

Glu Ile Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu Pro Ser
580 585 590

Val Phe Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser
595 600 605

Gly Val Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala
610 615 620

Leu Ser Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp
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Ala Thr Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly
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Glu Asn Asp Tyr Val Ala Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala
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Thr Glu Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn
675 680 685

Gly Tyr Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu
690 695 700

Leu Glu Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys
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Ile Asn Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg
725 730 735

Asn Met Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg
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Val Phe Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro
755 760 765

Val Glu Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro Val Asp
770 775 780

Glu Lys Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu Glu Lys
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Val Lys Asn Glu Ala Lys Lys Lys
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35 40 45

Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val Asp Gly
50 55 60

Gln Met Thr Leu Val Asp Gln His Gly Glu Lys Ile Gln Leu Arg Gly
65 70 75 80

Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn Asp Asn
85 90 95

Ala Tyr Lys Ala Leu Ala Asn Asp Trp Glu Ser Asn Met Ile Arg Leu
100 105 110

Ala Met Tyr Val Gly Glu Asn Gly Tyr Ala Ser Asn Pro Glu Leu Ile
115 120 125

Lys Ser Arg Val Ile Lys Gly Ile Asp Leu Ala Ile Glu Asn Asp Met
130 135 140

Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro Arg Asp
145 150 155 160

Pro Val Tyr Ala Gly Ala Glu Asp Phe Phe Arg Asp Ile Ala Ala Leu
165 170 175

Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu Pro Ser
180 185 190

Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu Gly Trp
195 200 205

Asn Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Glu Met Leu Arg Asp
210 215 220

Ser Gly Asn Ala Asp Asp Asn Ile Ile Ile Val Gly Ser Pro Asn Trp
225 230 235 240

Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp His His
245 250 255

Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala Ser Thr
260 265 270

Glu Ser Tyr Pro Pro Glu Thr Pro Asn Ser Glu Arg Gly Asn Val Met
275 280 285

Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe Ala Thr
290 295 300

Glu Trp Gly Thr Ser Gln Ala Asn Gly Asp Gly Gly Pro Tyr Phe Asp
305 310 315 320

Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile Ser Trp
325 330 335

Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala Phe Thr
340 345 350

Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Ser Leu Asp Pro Gly Pro
355 360 365

Asp Gln Val Trp Val Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val
370 375 380

Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys
385 390 395 400

Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe
405 410 415

Gly Val Asn Gly Asp Ser Pro Val Glu Asp Val Val Ile Glu Asn Glu
420 425 430

Ala Gly Ala Leu Lys Leu Ser Gly Leu Asp Ala Ser Asn Asp Val Ser
435 440 445

Glu Gly Asn Tyr Trp Ala Asn Ala Arg Leu Ser Ala Asp Gly Trp Gly
450 455 460

Lys Ser Val Asp Ile Leu Gly Ala Glu Lys Leu Thr Met Asp Val Ile
465 470 475 480

Val Asp Glu Pro Thr Thr Val Ser Ile Ala Ala Ile Pro Gln Gly Pro
485 490 495

Ser Ala Asn Trp Val Asn Pro Asn Arg Ala Ile Lys Val Glu Pro Thr
500 505 510

Asn Phe Val Pro Leu Glu Asp Lys Phe Lys Ala Glu Leu Thr Ile Thr
515 520 525

Ser Ala Asp Ser Pro Ser Leu Glu Ala Ile Ala Met His Ala Glu Asn
530 535 540

Asn Asn Ile Asn Asn Ile Ile Leu Phe Val Gly Thr Glu Gly Ala Asp
545 550 555 560

Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val Glu Ile
565 570 575

Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu Pro Ser Val Phe
580 585 590

Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser Gly Val
595 600 605

Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala Leu Ser
610 615 620

Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp Ala Thr
625 630 635 640

Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly Glu Asn
645 650 655

Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala Thr Glu
660 665 670

Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn Gly Tyr
675 680 685

Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu Leu Glu
690 695 700

Glu Pro Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys Ile Asn
705 710 715 720

Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg Asn Met
725 730 735

Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg Val Phe
740 745 750

Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro Val Glu
755 760 765

Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro Val Asp Glu Lys
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Glu Ala Lys Thr Glu Gln Lys Glu Ala Glu Lys Glu Glu Lys Glu Glu
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35 40 45

Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val Asp Gly
50 55 60

Gln Met Thr Leu Val Asp Gln His Gly Glu Lys Ile Gln Leu Arg Gly
65 70 75 80

Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn Asp Asn
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Ala Tyr Lys Ala Leu Ala Asn Asp Trp Glu Ser Asn Met Ile Arg Leu
100 105 110

Ala Met Tyr Val Gly Glu Asn Gly Tyr Ala Ser Asn Pro Glu Leu Ile
115 120 125

Lys Ser Arg Val Ile Lys Gly Ile Asp Leu Ala Ile Glu Asn Asp Met
130 135 140

Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro Arg Asp
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Pro Val Tyr Ala Gly Ala Glu Asp Phe Phe Arg Asp Ile Ala Ala Leu
165 170 175

Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu Pro Ser

180

185

190

Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu Gly Trp
195 200 205

Asn Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Glu Met Leu Arg Asp
210 215 220

Ser Gly Asn Ala Asp Asp Asn Ile Ile Val Gly Ser Pro Asn Trp
225 230 235 240

Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp His His
245 250 255

Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala Ser Thr
260 265 270

Glu Ser Tyr Pro Pro Glu Thr Pro Asn Ser Glu Arg Gly Asn Val Met
275 280 285

Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe Ala Thr
290 295 300

Glu Trp Gly Thr Ser Gln Ala Asn Gly Asp Gly Gly Pro Tyr Phe Asp
305 310 315 320

Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile Ser Trp
325 330 335

Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala Phe Thr
340 345 350

Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Ser Leu Asp Pro Gly Pro
355 360 365

Asp Gln Val Trp Val Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val
370 375 380

Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys
385 390 395 400

Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe
405 410 415

Gly Val Asn Gly Asp Ser Pro Val Glu Asp Val Val Ile Glu Asn Glu
420 425 430

Ala Gly Ala Leu Lys Leu Ser Gly Leu Asp Ala Ser Asn Asp Val Ser
435 440 445

Glu Gly Asn Tyr Trp Ala Asn Ala Arg Leu Ser Ala Asp Gly Trp Gly
450 455 460

Lys Ser Val Asp Ile Leu Gly Ala Glu Lys Leu Thr Met Asp Val Ile
465 470 475 480

Val Asp Glu Pro Thr Thr Val Ser Ile Ala Ala Ile Pro Gln Gly Pro
485 490 495

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500 505 510

Asn Phe Val Pro Leu Gly Asp Lys Phe Lys Ala Glu Leu Thr Ile Thr
515 520 525

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Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val Glu Ile
565 570 575

Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu Pro Ser Val Phe
580 585 590

Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser Gly Val
595 600 605

Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala Leu Ser
610 615 620

Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp Ala Thr
625 630 635 640

Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly Glu Asn
645 650 655

Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala Thr Glu
660 665 670

Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn Gly Tyr
675 680 685

Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu Leu Glu
690 695 700

Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys Ile Asn
705 710 715 720

Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg Asn Met
725 730 735

Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg Val Phe
740 745 750

Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro Val Glu
755 760 765

Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro Val Asp Glu Lys
770 775 780

Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu Glu Lys Glu Ala
785 790 795 800

Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys Lys Ala Ile Lys
805 810 815

Asn Glu Ala Thr Lys Lys
820

<210> 9
<211> 810
<212> PRT
<213> *Bacillus* sp. strain KSM-N131

<400> 9

Met Met Leu Arg Lys Lys Thr Lys Gln Leu Gly Arg Pro Ala Gln Ala
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Glu Gly Asn Thr Arg Glu Asp Asn Phe Lys His Leu Leu Gly Asn Asp
20 25 30

Asn Val Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val
35 40 45

Asp Gly Gln Met Thr Leu Val Asp Gln His Gly Glu Lys Ile Gln Leu
50 55 60

Arg Gly Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn
65 70 75 80

Asp Asn Ala Tyr Lys Ala Leu Ser Asn Asp Trp Asp Ser Asn Met Ile
85 90 95

Arg Leu Ala Met Tyr Val Gly Glu Asn Gly His Ala Thr Asn Pro Glu
100 105 110

Leu Ile Lys Gln Arg Val Ile Asp Gly Ile Glu Leu Ala Ile Glu Asn
115 120 125

Asp Met Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro
130 135 140

Arg Asp Pro Val Tyr Ala Gly Ala Lys Asp Phe Phe Arg Glu Ile Ala
145 150 155 160

Ala Leu Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu
165 170 175

Pro Ser Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu
180 185 190

Gly Trp Lys Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Gln Met Leu
195 200 205

Arg Lys Ser Gly Asn Ala Asp Asp Asn Ile Ile Ile Val Gly Ser Pro
210 215 220

Asn Trp Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp
225 230 235 240

His His Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala
245 250 255

Ser Thr Glu Ser Tyr Pro Pro Glu Thr Pro Asn Ser Glu Arg Gly Asn
260 265 270

Val Met Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe
275 280 285

Ala Thr Glu Trp Gly Thr Ser Gln Ala Asn Gly Asp Gly Gly Pro Tyr
290 295 300

Phe Asp Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile
305 310 315 320

Ser Trp Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala
325 330 335

Phe Thr Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Ser Leu Asp Pro

340

345

350

Gly Pro Asp Gln Val Trp Val Pro Glu Glu Leu Ser Leu Ser Gly Glu
355 360 365

Tyr Val Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg
370 375 380

Thr Lys Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln
385 390 395 400

Gly Phe Gly Val Asn Ser Asp Ser Pro Asn Lys Glu Leu Ile Ala Val
405 410 415

Asp Asn Glu Asn Asn Thr Leu Lys Val Ser Gly Leu Asp Val Ser Asn
420 425 430

Asp Val Ser Asp Gly Asn Phe Trp Ala Asn Ala Arg Leu Ser Ala Asn
435 440 445

Gly Trp Gly Lys Ser Val Asp Ile Leu Gly Ala Glu Lys Leu Thr Met
450 455 460

Asp Val Ile Val Asp Glu Pro Thr Thr Val Ala Ile Ala Ala Ile Pro
465 470 475 480

Gln Ser Ser Lys Ser Gly Trp Ala Asn Pro Glu Arg Ala Val Arg Val
485 490 495

Asn Ala Glu Asp Phe Val Gln Gln Thr Asp Gly Lys Tyr Lys Ala Gly
500 505 510

Leu Thr Ile Thr Gly Glu Asp Ala Pro Ser Leu Glu Ala Ile Ala Met
515 520 525

His Ala Glu Asn Tyr Thr Ile Asn Asn Ile Ile Leu Phe Val Gly Thr
530 535 540

Glu Gly Ala Asp Val Ile Tyr Leu Asp Thr Ile Lys Val Ile Gly Pro
545 550 555 560

Glu Val Glu Ile Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu
565 570 575

Pro Ser Val Phe Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly
580 585 590

Glu Ser Gly Val Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser
595 600 605

Asn Ala Leu Ser Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp
610 615 620

Asn Trp Ala Thr Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val
625 630 635 640

Arg Gly Glu Asn Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val
645 650 655

Arg Ala Thr Glu Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro
660 665 670

Thr Asn Gly Tyr Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe
675 680 685

Asp Glu Leu Glu Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu
690 695 700

Val Lys Ile Asn Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu
705 710 715 720

Leu Arg Asn Met Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala
725 730 735

Gly Arg Val Phe Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr
740 745 750

Glu Pro Val Glu Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro
755 760 765

Val Asp Glu Lys Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu
770 775 780

Glu Lys Glu Ala Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys
785 790 795 800

Lys Ala Ile Lys Asn Glu Ala Thr Lys Lys
805 810